DESY R&D work related to WG4
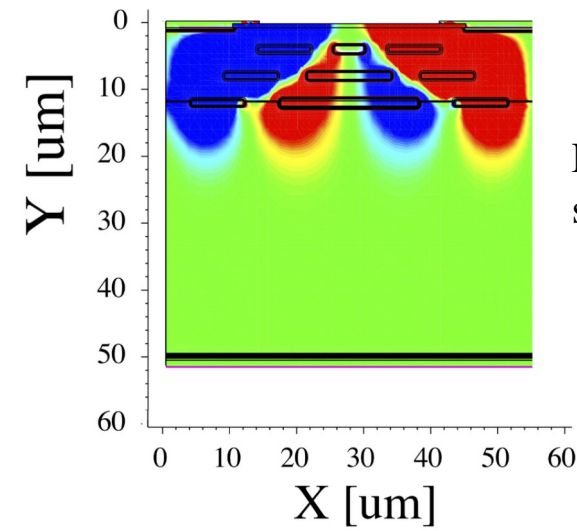
Simon Spannagel

22/7 -24

General

- Simulation work being carried out in

  - Charge generation and transport in semiconductors

  - Monolithic active pixel sensors

  - Strip sensors

  - 3D sensors

  - Front-end electronics response

  - Sensor capacitance

- Development of a simulation toolbox for MAPS simulations, free from proprietary information

- Main development and maintenance of the Allpix Squared simulation framework

- Simulation-guided design of sensor prototypes

- Contact person: Simon Spannagel

  - simon.spannagel@desy.de

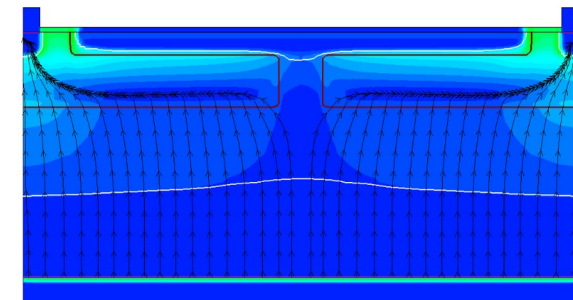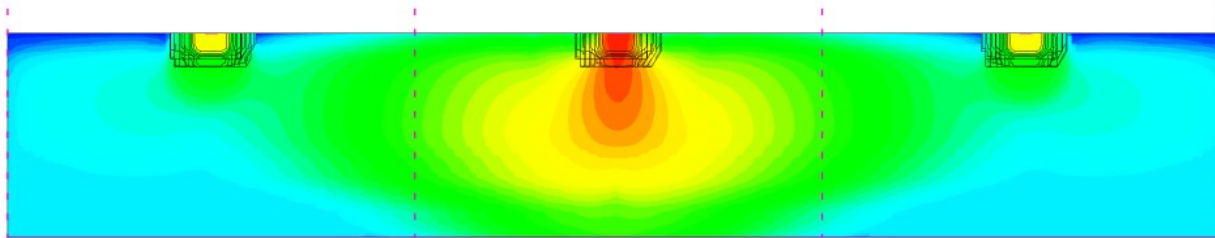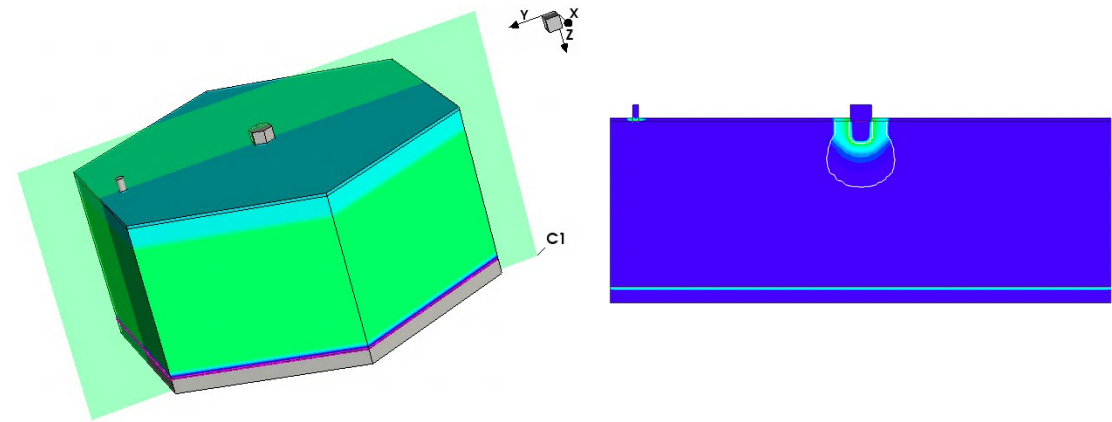# More detail: TCAD

Enhanced Lateral Drift
sensor simulation, A. Velyka
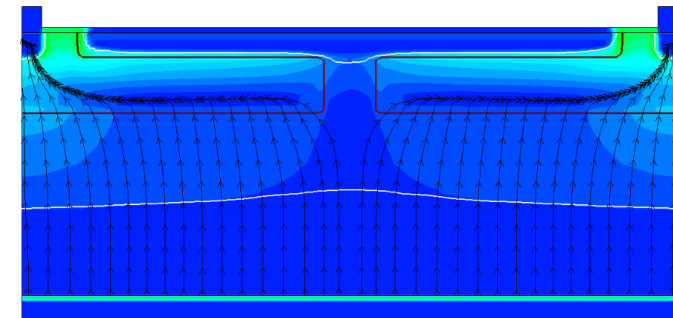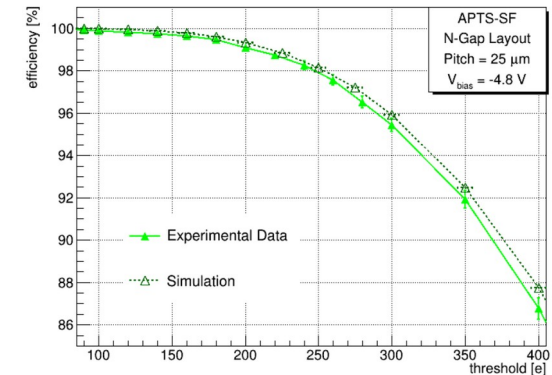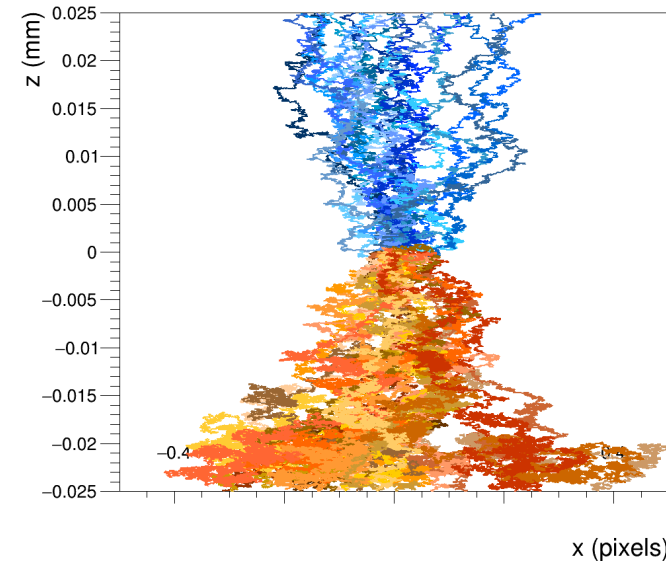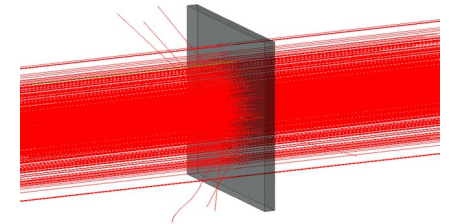
- Involved in several silicon sensor projects

  - Small collection electrode MAPS

  - CMOS strip sensors

  - Enhanced lateral drift sensors

- Includes investigations of electric fields, weighting fields, current densities, capacitances, ...
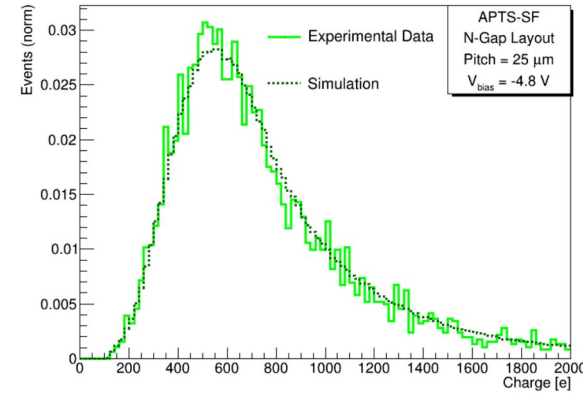
- Utilising Sentaurus TCAD
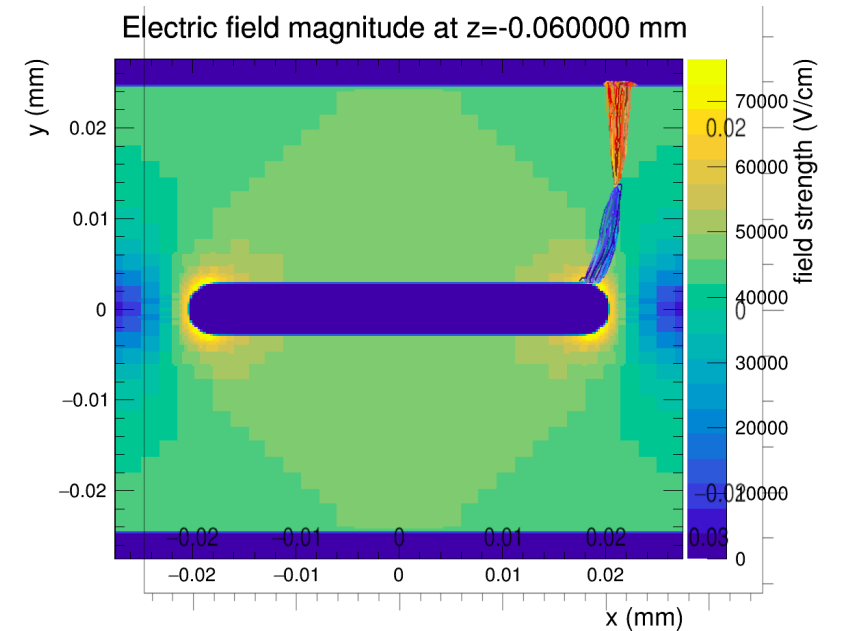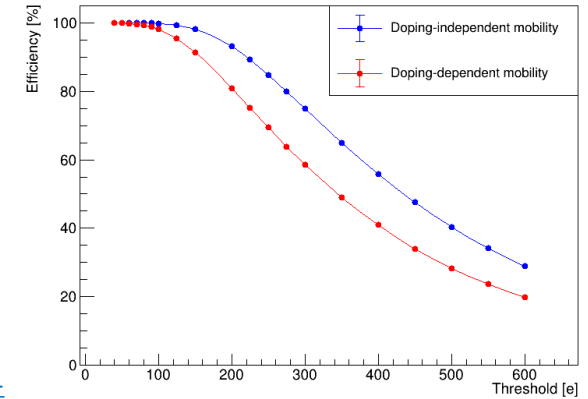
More detail: Monte Carlo

https://doi.org/10.1016/j.nima.2024.169414

- End-to-end simulations of thin MAPS detectors in 65 nm CIS and 180 nm CIS

  - Combined with the TCAD simulations
  - Comparing to output of prototype sensor tests

- Simulations of hexagonal pixel geometries

- Simulations of CMOS strip sensors

- Main development and maintenance of Allpix Squared

  - Impact ionisation and gain
  - 3D sensors
  - Ongoing developments:
    - High charge densities (screening and plasma effects)
    - Interfacing with front-end electronics simulation software

Electric field magnitude at z=-0.060000 mm

Backup slides